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ABSTRACT

A total of 90 fifth- and sixth-grade students studied a map of the fictitious island while twice listening to a 1,100-word prose passage describing it. The description included 16 nouns that had been chosen as map features. Map features were identified by labels and icons. Afterwards, students were given a cued recall test with 16 feature-related and 16 nonfeature-related items. During testing for recall, students had access to one of four maps. Maps contained the island boundary alone, boundary and icons, boundary and labels, or boundary and icons and labels. Response certainty measures were obtained. After 6 weeks, testing was repeated. Results conformed with predictions derived from the conjoint retention hypothesis, a derivative of dual coding theory, in which semantic propositions are assumed to represent verbal and linguistic information, and images represent perceptual and spatial information. The hypothesis further assumes that the two types of code can provide retrieval cues across codes and that the map is stored as an intact unit that maintains spatial relations among features, thereby providing an economy of representation when the map is in working memory. Findings indicated that a real distribution of features significantly improves performance. Multiple representations provide an additional boost in performance. (RH)

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Children's Retrieval of Classroom Materials: A Test of Conjoint Retention

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Abstract

Fifth and sixth grade students studied a map of a fictitious island while twice auding a text about the island. Map features were identified by both labels and icons. Subsequently, students received a cued recall test with 16 feature-related and 16 non-feature-related items. During recall students had one of four maps to facilitate recall, either the boundary of the island with; (a) nothing added, (b) icons, (c) labels, or (d) both icons and labels. Response certainty measures were also obtained. After six weeks, testing was repeated. Results conformed with predictions derived from the conjoint retention hypothesis.

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Summary

People remember more information from a prose passage if they are provided a spatially organized map depicting features contained in the narrative. Recall and recognition are facilitated when subjects create or process maps associated with text to be read (Dean & Kulhavy, 1981), or auded (Schwartz & Kulhavy, 1981, Abel & Kulhavy, 1986). The locus of facilitation is in items related to map features (Kulhavy, Lee & Caterino, 1985). In all cases, recall is facilitated when the map is semantically related to the text and features are distributed over the map's areal domain.

One explanation of these results is given by the conjoint retention hypothesis, a derivative of dual coding theory, where semantic propositions are assumed to represent verbal/linguistic information, and images represent perceptual/spatial information. It is also assumed these two types of code can provide retrieval cues to one another. Further, it is assumed the map is stored as an intact unit that maintains spatial relations among features (Kulhavy, Schwartz, & Shaha, 1983), thereby providing an economy of representation when the map is in working memory. At recall, retrieval cues initiate a search of semantic networks, and if a correct response is found, search activity ends. If target information is not located by a search of semantic networks, a representation of the map is activated in working memory and encoded features of the representation provide second order cues to the semantic networks.

Kulhavy, Caterino and Melchiori (1989) validated and extended predictions based on the conjoint retention hypothesis. They replicated the finding that verbal content is best remembered

when it is tied to an intact spatial representation during encoding. However, by providing subjects a copy of a label-only map at recall they increased the number of features that could be used as second stratum cues for retrieval access.

Previous research on the facilitating effects of maps has not systematically examined retrieval mechanisms, a limitation that the current study was designed to correct. Specifically, subjects were allowed to study a text while twice auding a text. The map studied contained 16 target features that were represented by both a verbal label and a mimetic icon, thereby providing subjects an opportunity to encode the map in either a semantic or image code. During recall students had one of four maps to facilitate recall, either the boundary of the island with; (a) nothing added, (b) icons, (c) labels, or (d) both icons and labels. Six weeks after original testing, subjects completed the recall task a second time. Thus, the design allowed us to address the relative effectiveness of the various retrieval cues and the durability of these cues over time.

Method

Design and Subjects

The design included one between-subjects factor, type of map cue, and two within-subjects factors, type of test item and occasion. There were four types of map cue, either the boundary map with features depicted; (a) not at all (called boundary), (b) by icons (icon), (c) by verbal labels (label), or (d) by both icons and labels (original). The two types of text material tested were Ninety fifth and sixth grade students from an upper middle class elementary school in the southwest participated.

Materials

An 1100 word prose passage describing a fictitious island and its people formed the text for this study. Sixteen nouns chosen from 16 different paragraphs were chosen as map features. On the original study map depicting the island, these features were identified with both verbal labels and mimetic icons. There were four types of cueing maps, including the original, one with labels only, one with icons only, and one with just the island boundary. Cued recall items were constructed by testing content that could only be answered by information available in the passage. Sixteen feature and 16 nonfeature-related items were constructed.

Procedure

Students studied the original map while twice auding the prose passage, which was read by a male at a comfortable rate for listening. Subsequent to auding the passage, students were given the recall test containing 16 feature and 16 non-feature related items. While responding to these questions, they were provided with one of the four cueing maps to facilitate recall. They were required to rate their level of certitude for each response as well. In addition, subjects reproduced the original map using the outline only and rated certitudes for both feature recall and feature location. After 6 weeks, the recall test and map reproduction were repeated.

Results and Discussion

Results supported the conjoint retention hypothesis. Recall of feature related items was significantly higher than nonfeature items, both at first test and at the delayed test. Comparison of

the type of cueing map indicated students receiving the original map out performed those receiving either the label or icon maps, which did not differ from each other but did outperform those receiving the boundary map. Thus, areal distribution of features significantly improves performance, and having multiple representations provides an additional boost in performance.

As expected, recall falls off at the delayed testing occasion. Feature related recall for those receiving cueing maps that were original in form or had icons only appeared to fall off at slower rates than in other cueing conditions.

Finally, there is a significant relation between level of response certitude (for original responses and for reconstruction of map features) and delayed recall of test information.

These results are consistent with the conjoint retention hypothesis in that areal distribution of features, whether in verbal or iconic form, facilitate recall of related information -- even though the map in any form does not provide enough information to answer the questions. Further analyses suggest that iconic representations persist longer as retrieval cues, and that response certitude provide a possible means of identifying which items will remain accessible over extended time periods.

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